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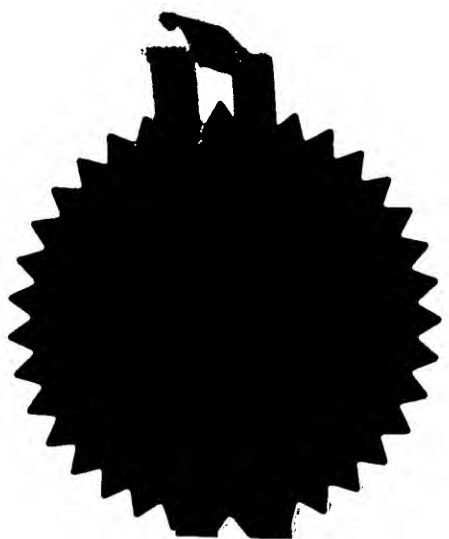
I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

I also certify that the attached copy of the request for grant of a Patent (Form 1/77) bears an amendment, effected by this office, following a request by the applicant and agreed to by the Comptroller-General.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

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Signed *William Morell*

Dated 11 April 2005

"An Improved Expanding Pipe Stopper."

This invention relates to an improvement in expanding pipe stoppers for sewer pipes, industrial applications and the like, also known as drain plugs or bungs.

5       Such stoppers include arrangements wherein co-axial plates are moved towards each other by pivotable cam means to squeeze a radially outwardly-expanding seal disposed between them into contact with the bore of a pipe, an annular wear plate in the form of a plane washer being  
10       interposed between the cam means and the adjacent one of said co-axial plates. The wear plate is disposed on an externally screw-threaded spigot fixed to the centre of one of said co-axial plates and passing through a central aperture in the other of said co-axial plates whereby an  
15       internally screw-threaded collar on which the cam means are pivotally mounted about a diametrical axis can be adjusted in axial position. This known arrangement has the disadvantages that the cam means when operated tend to force the co-axial plates towards each other in a non-  
20       parallel manner; and also push the wear plate sideways into engagement with the screw threads on the spigot, causing jamming of the desired squeezing action of the cam means.

The object of the present invention is to avoid the aforesaid disadvantages.

25       According to the invention, an expanding pipe stopper for inserting within a pipe comprises two rigid circular plates of substantially the same diameter adapted to be

2

inserted wholly within a bore of the pipe, an outwardly-expandable annular flexible seal located between adjacent peripheral surfaces of the two plates so as to be capable of projecting radially therefrom, a spigot fixed to the  
5 centre of one of said plates and extending through a central hole in the other of said plates, a collar connected to the spigot on that side of said other plate remote from said one plate, cam means pivotable about an axis on the collar radially offset from the centre-line of  
10 the spigot and disposed in a plane perpendicular to said line by a lever fixed to the cam means between one position in which the plates do not compress the seal to force it into engagement with the bore of the pipe and another position in which the cam means force the plates relatively  
15 towards each other so as to compress the seal and thus expand it outwardly to engage in sealing contact with the bore of the pipe, a member fixed to the collar and adapted to contact the bore of the pipe so as to provide a reactive force to tilting of the stopper out of its operative  
20 position perpendicular to the axis of the pipe, and an annular wear plate interposed between the cam means and said other plate.

The wear plate preferably fits closely, in its inoperative position, in a bore co-axial with the centre-  
25 line of the spigot formed in the adjacent face of the collar.

Preferably, the collar and the spigot have mating internal and external screw threads whereby the collar is adjustable in axial position along the spigot, and the inner periphery of the wear plate is of sufficient thickness to contact the spigot across a plurality of threads.

Preferably, also, that face of the wear plate which is adapted to contact said other plate is provided with a plurality of concentric ribs, and with diametrically-opposed recesses or projections for engagement with mating projections or recesses on said other plate.

Preferably, the cam means carry two pivot pins each of which has an enlarged cylindrical head adapted to fit in an associated recess concentric with the axis on the collar, and a flat on its periphery adapted to slide through a cranked slot communicating with the recess in order to install the cam means and the lever on the collar in a first orientation of said means and lever, whereafter said means and lever are rotated about said axis between a second orientation constituting said one position and a third orientation constituting said other position.

Preferably, also, the member is fixed to the collar on the opposite side thereof to the offset axis of the cam means.

A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, of which:-

4

Figure 1 is a sectional side elevation of an expanding pipe stopper in inoperative position;

Figure 2 is a perspective view of a collar forming part of the stopper; and

5 Figure 3 is a side elevation of the pipe stopper illustrating the movement of its parts from inoperative to operative position.

Referring now to the drawings, an expanding stopper for inserting within pipes having bores up to, say, nine  
10 inches (22.86 centimetres) in diameter comprises one rigid circular plate 10 having a peripheral seat 12 and another rigid circular plate 14 of the same diameter as the plate 10 and having a peripheral seat 16, the seats 12 and 16 facing each other and serving to locate an annular flexible  
15 seal 18 of rubber or the like between the two adjacent peripheral surfaces of said plates so as to project radially therefrom. The seal 18 is convex in cross-section so as to be outwardly-expandable. A tubular spigot 20 is fixed in a short tubular opening 22 formed integrally in  
20 the centre of the plate 10, and extends through a central clearance hole 24 in the plate 14. The spigot 20 has an external screw thread 26, and a collar 28 is connected to said spigot on that side of the plate 14 remote from the plate 10 by a mating internal screw thread 30. The screw-  
25 threaded connection 26, 30 enables the collar 28 to be adjusted in axial position along the spigot 20 to suit slightly different pipe bore diameters. Cam means

comprising two identical plates 32 straddling the collar 28 are pivotable about an axis 34 on the collar 28 radially offset from the longitudinal centre-line 35 of the spigot 20 and disposed in a plane perpendicular to said line by a U-shaped hand lever 36 which straddles the collar 28 and is fixed to the cam plates 32. Said plates are pivotable by the lever 36 between a position A in Figure 3 in which said plates do not compress the seal 18 to force it into engagement with the bore of the pipe and a position C in Figure 3 in which said plates force the plates 10 and 14 relatively towards each other so as to compress the seal 18 and thus expand it outwardly to engage in sealing contact with the bore of the pipe. The cam means carry two pivot pins 38 each of which has an enlarged cylindrical head 40 adapted to fit in an associated recess 42 (see Figure 2) concentric with the axis 34, and a flat 43 on its periphery adapted to slide through a cranked slot 44 communicating with the recess 42 in order to install the cam means and the lever 36 in a first orientation of said means and lever, whereafter said means and lever are rotated about said axis between a second orientation constituting the position A and a third orientation constituting the position C. A member 46 formed integrally with the collar 28 on the diametrically opposite side thereof to the axis 34 is adapted to contact the bore of the pipe so as to provide a reactive force to tilting of the stopper out of its operative position perpendicular to the axis of the

6

pipe. A wear plate 48 is interposed between the cam means and the plate 14 and as shown in Figure 1 has a boss 49 adapted to fit closely, in its inoperative position, in a bore 50 co-axial with the longitudinal centre-line of the spigot 20 formed in the adjacent face of the collar 28. The inner periphery 52 of the wear plate 48 is of sufficient thickness to contact the spigot 20 across a plurality of screw threads. That face of the wear plate 48 which is adapted to contact the plate 14 is provided with two flat-topped concentric rings 54, and with two diametrically-opposed recesses 56 for engagement with mating projections which may be provided on the plate 14.

In operation, the pipe stopper is disposed in the mouth of a pipe, and the hand lever 36 is moved as shown in Figure 3 from the position A through an arc including position B to the position C. The positions of the plate 14, the seal 18 and the wear plate 48 which correspond to the positions A and C of the lever 36 are shown collectively as D and E respectively. The consequential pivotal movement of the cam plates 32 about the offset axis 34 forces the wear plate 48 into contact with the plate 14 so as in turn to force the plates 10 and 14 relatively towards each other as hereinbefore described in order to expand the seal 18 into sealing contact with the bore of the pipe. Due to the offset disposition of the axis 34, the action of the cam plates 32 is first applied appreciably nearer to the centre-line of the wear plate 48

than would be the case if said axis were not offset. This forces the co-axial plates towards each other in a substantially parallel manner, and also significantly reduces the sideways thrust on the wear plate 48 which would otherwise tend to restrict the smooth operation of the stopper by being pushed sideways into engagement with the screw threads on the spigot 20. Deleterious sideways movement of the wear plate 48 is also prevented during the initial part of pivoting of the lever 36 from position A by the nesting of its boss 49 in the bore 50, after which the wear plate 48 moves clear of the collar 28. In the event that the wear plate 48 nevertheless tends to move sideways during the later part of the pivoting of the lever 35 into position C, the thickness of its inner periphery 52 prevents its engagement with the screw threads on the spigot 20, and thus avoids consequent jamming. Sideways movement of the wear plate 48 is further inhibited during the later part of pivoting of the lever 36 into position C by frictional grip between the rings 54 and the plate 14. After installation of the stopper in a pipe, a conventional end cap (not shown) can be screwed onto the end of the spigot 20 if desired, a plain cap being used to seal the pipe or alternatively a cap with a nipple being used to enable the pipe to be tested in known manner by injecting water or air.



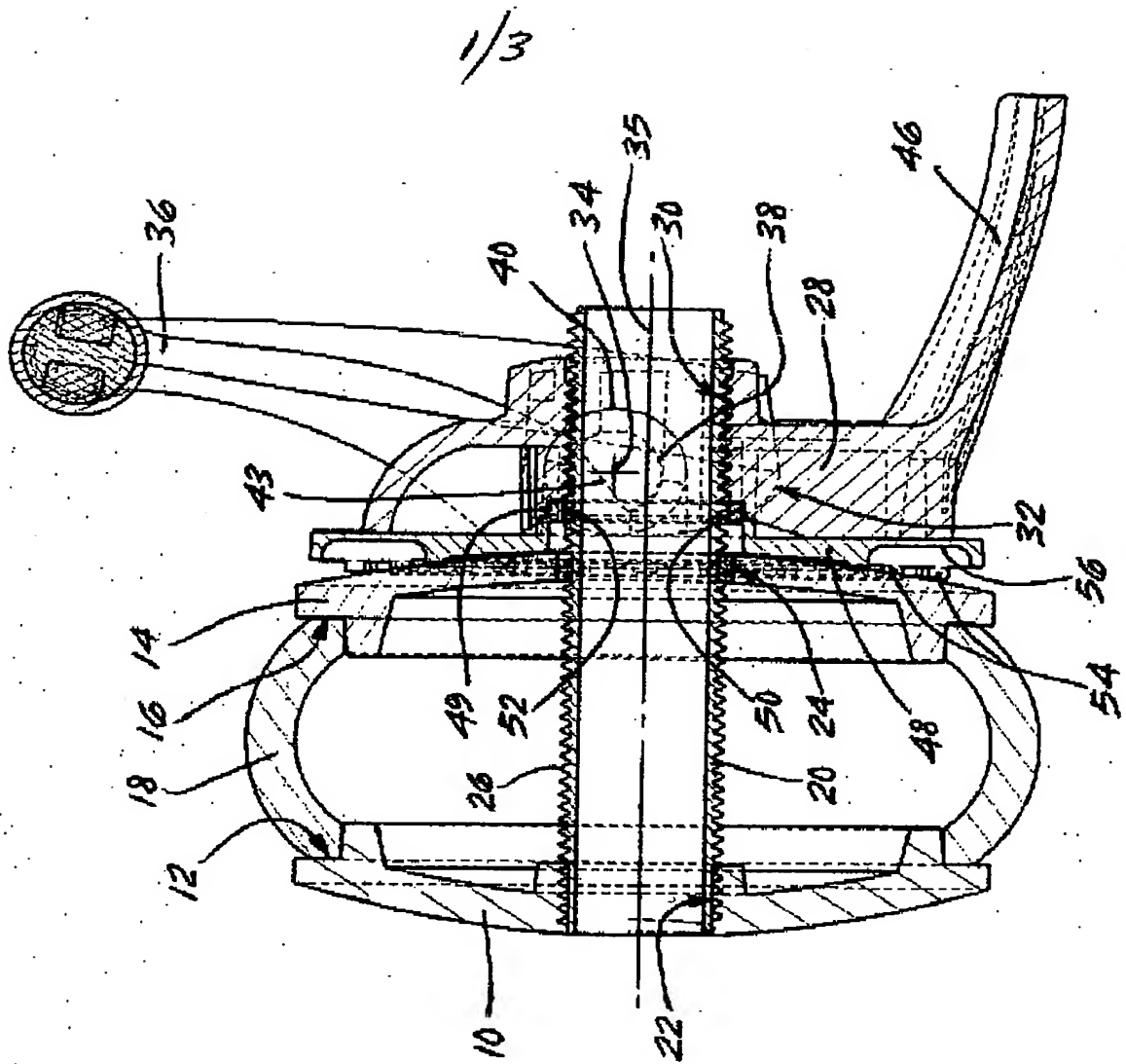
8

The collar 28, cam plates 32 with lever 36, and wear plate 48 can be retro-fitted to existing pipe stoppers with screw-threaded spigots 20 if so desired.

In a modification, the screw threads are omitted and  
5 the collar is rigidly secured to the spigot, or is adjustable incrementally along the spigot by means of a pin selectively engageable in a diametrical hole in the collar and in one of a series of axially-spaced diametrical holes in the spigot.

10 In another modification, the wear plate is provided with diametrically-opposed projections for engagement with mating recesses provided in the plate 14.

In a further modification, the member 46 is a  
15 separate element which is rigidly secured to the collar.



2/3

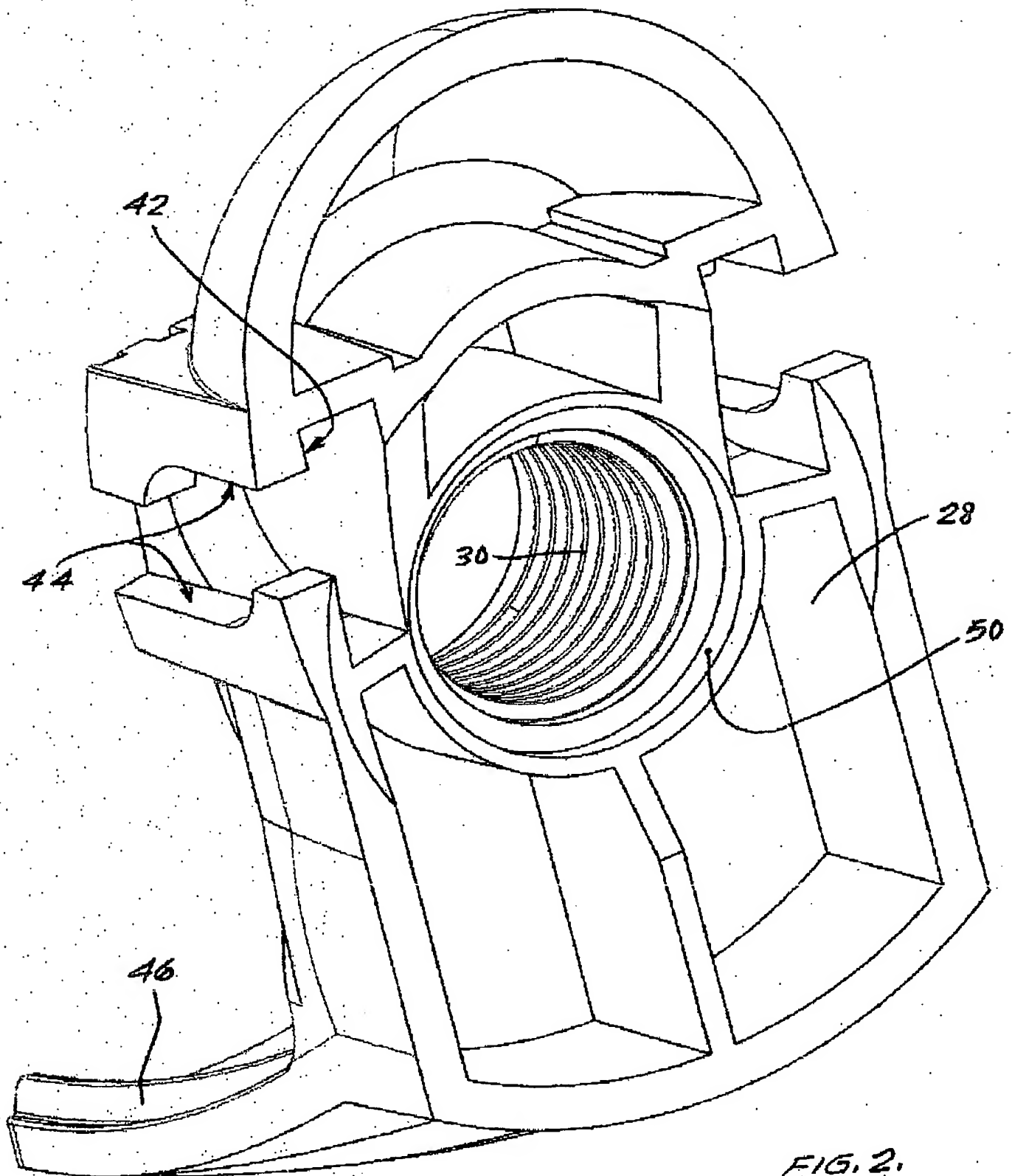


FIG. 2.

3/3

FIG. 3,

